Colony of Seychelles.

IMPERIAL MYCOLOGICAL INSTITUTE
6 NOV. 1933

ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE

FOR THE

YEAR 1932

Published by Command of His Excellency the Governor.

Printed by the Supt. of Printing,
At the Government Printing Office,
Victoria, Mahé—Seychelles.

1933.

1932

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STAFF OF THE AGRICULTURAL AND FOREST DEPARTMENT SEYCHELLES.

—(o)—

Hon. P. R. Dupont, F. L. S., Director of Agriculture.

*F. L. Squibbs, Assistant Director.

*W. Holdsworth, Distillery Expert.

E. Nageon de Lestang, Inspector of Plantations.

A. Houareau, Assistant Inspector of Plantations.

N. Carrère, Clerk.

A. Gendron, Senior Forest Ranger.

E. Ethève, Forest Ranger, Praslin District.

L. Albert, Store-Keeper and Laboratory Attendant.

M. Tirant, Garden Foreman.

A. Azémia, Overseer.

J. Doway, Fisheries and Revenue Guard.

*Temporary Appointments.

COLONY OF SEYCHELLES.

Annual Report of the Department of Agriculture

FOR THE YEAR 1932.

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General Remarks.

The routine work of the Department included the following :—

1. care and maintenance of the Botanical and Town Gardens ; Hermitage Estate ; the Coco-de-mer reserves ; and the unleased Crown lands ;
2. development of nurseries for economic plants and experimental plots ;
3. experimental manuring of Coconuts on 18 Estates ;
4. re-afforestation of mountain reserves above the Niol Reservoir, and sale of timber and firewood below that level ;
5. supervision of river reserves in all districts, and investigating applications for the cutting of timber in these reserves ;
6. investigating applications for the cutting of Jack and Bread fruit trees ;
7. experimental breeding of silk and eri worms ;
8. sale of fertilizers to planters ;
9. supplying material and arranging for the distillation of essential oils ;
10. control of the fisheries reserves ;
11. destruction of rats and other pests ;
12. the upkeep of a small herd of Friesian cattle.

During the year the department was relieved of the burden of controlling the Excise Department and Licensing Board. The work was taken over by the Public Works Department.

The necessity of this transfer was represented owing to the extra work of an Agricultural nature devolving on the Department and the transfer of the Chief Excise Inspector as Clerk to the Public Works.

The adoption by the Right Honourable the Secretary of State of the recommendation of the Agricultural Adviser for the appointment of an Assistant Director for two years and an Expert Distiller for one year, paid out of the Colonial Development Funds, enabled the department to cope with the increased work. The details of a report by the Assistant Director is included in another chapter showing the ground he has so actively covered already in the propagation of economic plants likely to succeed in the Colony. These details show conclusively to what extent such an important additional service was needed under a competent officer.

The report of the Distillery Expert will be published after his return to London. In a preliminary report published in the Official Gazette (extraordinary) No. 36 of 16th August 1932, Mr Holdsworth brought forward a few points in connection with the distillation of Cinnamon Bark Oil, Patchouli Oil, and Eucalyptus citriodora oil which throw considerable light on the methods to be adopted in Seychelles if these industries are to be established on a firm footing.

2. Work in the garden and observations on plants.

Visitors to the Gardens are struck with the development of a few trees such as Albizzia moluccana & Parkia Roxburghii which have reached colossal dimensions within 28 years. Attention is again called to the first of these two trees, which besides restoring fertility to worn out soils in a short period of time, is found to yield an extraordinary amount of timber for indoor work. This timber is already in great demand, for roofing, & partitioning houses. The other tree (Parkia) is more exacting in its soil requirements and its timber is not as resistant to white ants as the other. This tree which is a mimosa is however very handsome as a shade tree and cover plant, but it fails unlike the other to reproduce itself in the jungle. Its pods are edible in Malaya and used for feeding pigs & poultry. A young Parkia a few weeks old with its acacia like leaves a yard long should occupy the place it deserves in all gardens.

The restoration of fertility of the soil in Seychelles in a natural way should appeal to all planters, who should devote that portion of their estate which is unfit for the cultivation of coconuts, to timber trees and cover plants. It is no use spending any more money and labour in the cultivation of coconuts in unsuitable soil when the selling price of copra is so low. It is not only an uneconomic proposition but the loss sustained in that way tells heavily on the general price of production which has to be lowered if the industry of coconut planting is to survive at all.

Among other economic plants doing well in the gardens are :—

1. A variety of Gliricidia (G. sepium) with broader leaves and robust habit.

2. Aleurites montana, one tree about 2 years old and 10 feet high, flowered but the fruits did not set. During rainy weather the tree seems to suffer, but it recovers quickly during the dry season.

3. One Hydnocarpus Wightiana (Chaulmoogra) near the Hospital produced 50 fruits from which several hundred seeds were secured for propagation. Hydnocarpus anthelmintica has not yet fruited but it has made excellent growth at 600 feet elevation at Niol.

4. A very handsome tree from Java, Antidesma bunius fruited for the first time. It produces abundantly, green, reddish, and bluish black berries which are said to be edible.

This tree is very susceptible to the green scale in the garden.

5. A beautiful Attalea cohune palm from British Honduras fruited for the first time in Government House Garden and another tree in the garden also produced male inflorescences which usually precede the female ones as in many other palms. The kernels of this palm produce an excellent oil.

6. My best thanks are due to Admiral Dunbar Nasmith and the Curator of the Peradeniya Gardens, Ceylon, for the introduction of the Sago palm from Ceylon. Two specimens were received after a journey of nearly two months. Only one survived, and is now a thriving plant. This palm is perhaps the most remarkable tropical plant. Each of its stems which follow in rapid succession contains on reaching maturity about 300 lbs of Sago starch.

7. Avocado pears from Mauritius and Guatemala have not fruited well in spite of bark ringing and root pruning. The younger trees from Jamaican seeds are making excellent growth. More of these fruit trees should be grown as it has now been found that its one day flowers are unisexual and that its male flowers do not open at the same hour of the day as the female flowers on the same plant. As it is extremely difficult to propagate this plant by layering, a group of trees from seeds should be set out near one another to ensure pollination.

I received during the year a reprint of the publication by Mr V. S. Summerhayes of Kew on the Angiosperms of the Seychelles (Mahé group) which throws considerable light on the native flora of the Colony. It was in 1877 that J. E. Baker published an enumeration of the plants of Seychelles. Since then many investigations have been made by Professor Stanley Gardiner, Mr H. P. Thomasset and myself and the flora of Seychelles has been brought almost up to date by information which has accumulated at Kew during the last 30 years. In Baker's flora (1877) 480 species of plants were described. Owing to bush fires, shifting cultivation and felling of the large timber trees the original vegetation has been completely modified. 247 species of plants that have escaped from cultivation now occupy large areas on which the indigenous flora has been destroyed for ever. The remaining 233 species which may be considered as indigenous are divided by Mr Summerhayes into:

1. Marine plants, 8 species of which 5 are cosmopolitan;
2. Strand or littoral plants, 54 species which are mostly of Indo Malayan origin;
3. Inland plants 171 species which are mostly of Asiatic origin.

The littoral plants come mostly from Malaya, Seychelles being on the track of the sea currents of the S. E. Indian Ocean. A few come from the Mascarenes and Africa. These are circumscribed species (such as manglier blanc) owing to minor sea currents occurring between the African Coast, Madagascar and Seychelles.

In the inland species a strong Mascarene element predominates, a prominent Asiatic element comes next, and the African element is the smallest of all. As far as genera are concerned, the Asiatic element is stronger that the 2 others. The rain forest trees which formed the primitive vegetation of Seychelles consists almost entirely of genera of Asiatic origin "Capucin" (Northea) Bois de fer (Vateriopsis) Bois rouge (Wormia) Bois Montagne (Campnosperma) Vacoa (Pandanus) and palms. The Bois de Natte group (Mimusops) is of African origin and considered, at those from the Mascarenes, as having entered the country at a subsequent period.

Seychelles (Mahé group) having been a large island 20,000 square miles as evidenced by the present submerged bank which covers that area must have supported originally a large flora, when the island was split up into several smaller ones by the corresponding change of climate and erosion, as explained by Professor Stanley Gardiner in 1906 the indigenous flora was destroyed and only those species which were particularly abundant or possessed some special means of holding their own remained.

In Mahé and Silhouette which are more mountainous and partly inaccessible the denudation has been less extensive than in Praslin which is known to have suffered terribly in the past from forest fires. But there is no evidence to show that the indigenous species were not evenly distributed over the three groups of granitic islands with few exceptions such as (Roscheria palm and Coco-de-mer). There is such a small indigenous flora left (13 genera) that have no near relatives that it is impossible to surmise the exact way on which it may have entered the islands.

Work in the Nursery and distribution of Economic plants.

With a view to the development of possible new industries by the issue of economic plants at cheap rates, an additional amount to the vote "Propagation and Purchase of Plants and Seeds" was provided during the year for the extension of nurseries. These extensions were required for both the pot and open ground nurseries. For the pot nursery a new potting and store sheds were built and the necessary shelters for the plants erected. This pot nursery is intended for plants which require careful treatment and are later distributed in bamboo pots or boxes to ensue the well-being of the plants until their establishment in permanent quarters.

Plants grown in this nursery include :—

Eucalyptus citriodora

Pimento officinalis (all-spice)
Criollo cocoa (pure strain)
Areca nut
Nutmegs
Pepper
Mangoes etc.

A good start has already been made and there exists a keen demand for plants of Eucalyptus citriodora which are being propagated as quickly as possible.

The original nurseries near the Hospital were extended.

This work necessitated the blasting of many boulders and much levelling of land. A new nursery to the south of the Hospital on Hermitage estate was cleared, trenched and bedded up. This area can be considerably extended as required. The soil though physically good, is poor, and worn out and the first step was to sow it down with a good green dressing. It is intended to use this land for permanent planting of citrus now on order from S. Africa, the interspace to be used for nursery purposes, and trials of short crops. A large number of citrus seedlings have been raised and transplanted out to their budding quarters. The number so transplanted was over 1,000 at the end of the year. It is hoped to bud these stocks with commercial varieties of grape fruit and oranges, budwood of selected varieties having been requested through the Department of Agriculture, Union of South Africa.

In the past all citrus grown in the Colony have been from seedlings trees and the problem of a suitable stock for citrus has yet to be elucidated. In the absence of the true sour oranges and rough lemons commonly used as stocks in the citrus growing countries throughout the world it was decided to select a few local vigorous growing citrus. Orange Mozambique (a citrus with thick musk scented rind) Neroli (Citrus bigaradia) which as far as can be ascertained are not susceptible to gummosis.

Among the fruits capable of being grown in the Colony for export the grape-fruit stands foremost as there is a market for it in Bombay where the retailed price is 4 to 5 s/ a dozen. A serious drawback is poor soil conditions and the evidence of Scale and Canker disease.

Robusta coffee, Tuba root (Derris malaccensis) are propagated as speedily as cuttings and seeds are available. Plants of the genuine Motia which were spotted by the distillery expert are also being rapidly propagated as well as other citronellas and lemon grasses from Java and Ceylon.

Stock beds of the following cover crops are also maintained in the nurseries.

Indigofera endecaphylla.
Centrosema pubescens.
Tephrosia candida.
Canavalia ensiformis.
Crotolaria usambariensis.
Cajanus indica.
Dolichos marina.
Phaseolus lunatus, &c., &c.

At the request of several planters, the department, after considerable difficulties, imported 2 tons of selected Castor seed from the Government of the United provinces, India and ½ ton of selected varieties of mountain rice from the Agricultural Department, Java. It is much regretted that no effort was made by the planters concerned to give these crops a trial. The results obtained by a single applicant for mountain rice seed were however most encouraging.

The following plants were sold to the public besides ordinary ornamental annuals :

Economic plants :	Eucalyptus citriodora & filicifolia
,, ,,	Rambutan (Nephelium lappaceum)
,, ,,	Nutmegs (Myristica fragrans)
,, ,,	Mangoes (Mangifera indica)
,, ,,	Mangosteen (Garcinia mangostana)
,, ,,	Star apple (Chrysophyllum cainito)
,, ,,	Brazil nut (Bertholletia excelsa)
,, ,,	Shaddock (Citrus decumana)
,, ,,	Eugenia aquea
,, ,,	Pepper (Malayan)
,, ,,	Coffee robusta
,, ,,	Oranges (Citrus aurantium)
,, ,,	Mountain Takamaka (Calophyllum parvifolium)
,, ,,	Rattan cane (Calamus and Desmoncus)
,, ,,	Pentadesma oleracea (Butter tree)
,, ,,	Pimenta officinalis (Allspice)
,, ,,	Cherimoya—Anona cherimoya
,, ,,	Murraya Koenigii (Caroopilay)
,, ,,	Selected coconuts
,, ,,	Euphoria longana
,, ,,	4 wardian cases of plants were forwarded to Zanzibar and South Rhodesia.
Miscellaneous.	Thuya orientalis
,,	Grevillea robusta
,,	Acacia polystachya
,,	,, confusa
,,	Brownea grandiceps

,,	Eugenia Javanica
,,	Pithecolobium unquis-cati
,,	Sourindeia Madagascariensis (small mango)
,,	Casuarina equisetifolia
,,	Bougainvillea laterita
Palms.	Areca catechu.

Plant importations.

Among the plants introduced during the year the following may be mentioned besides those enumerated in the other chapters of this report.

Economic plants.	Citrus medica acida (W. 1 lime)—Dominica
,, ,,	Pineapple suckers (Queen)—A. Africa
,, ,,	Mulberry cuttings—Tanganyika
,, ,,	Pogostemon Patchouli Penang var.—Ceylon
,, ,,	Piper nigrum—S. India
,, ,,	,, ,, —Malaya and Ceylon
,, ,,	Ajowan (Carum copticum)—Punjab
,, ,,	Teneriffe onion seed—Canary Is
Timber trees.	Tectona grandis (Teak tree)—Java
,, ,,	Parkia Africana — ,,
,, ,,	~~Chenopodium ambrosioides.~~ — ,,
,, ,,	Sweetenia Mahogani
Palms.	Acrocomia sclerocarpa—B. Guiana
,,	Maximiliana sp. — ,,
,,	Astrocaryum sp. — ,,
,,	Raphia vinifera —Sierra-Leone
Miscellaneous.	Tabebuia Guayacan—Mexico
,,	Cassia tomentosa — ,,
,,	Abroma augusta —Java
,,	Verbena erinoides—Italy
,,	Amherstia nobilis—Ceylon
,,	Saraca declinata — ,,
,,	Lagerstroemia tomentosa—Ceylon
,,	Licania arborea—Mexico
,,	Enterolobium cyclocarpum—Mexico
,,	Crescentia alata — ,,
,,	Guazuma ulmifolia — ,,
,,	Erythrina corallodendron — ,,
Flowering plants.	Gloriosa Abyssinica—Java
,,	A collection of 14 orchids from—Ceylon
,,	Salvia splendens—Italy.

Work connected with Insect Pests and Fungus diseases.

Among the insects identified during the year were the following :—

Lecanium (Saissetia) nigrum
Pulvinaria Grahami
Pinnaspis minor

All on castor oil plants which were also affected by the moth Physita poberiella its larvæ boring into the stem near the inflorescenes.

I am also indebted to the Entomologist at Peradeniya for a consignment of eggs of the leaf insect Pulchriphyllium crucifolium which was reared and distributed to a score of inhabitants who were interested in the life history of this insect when an allied species Pulchriphyllium gelosum occurred in the Colony. This latter insect became extinct and I took advantage of the kind offer of the Hon. Mrs Fullerton to have the allied species introduced into the Colony to satisfy the curiosity of many residents who regretted the disappearance of its congener.

The Seychelles species was living on guavas and jamrosa (Eugenia jambos) in the jungle but they were exterminated when the introduced martins (Acridotheris tristis) increased in number. I attempted last year unsuccessfully to have the martins removed from the list of protected birds. I do not believe much in their usefulness as insect eaters now that they have become omnivorous and feed on many fruits and jungle seeds.

An Entomological Investigation was also made into the ravages of a fruit fly and of a moth which attack oranges and tangerines. The fruits are punctured by the larvæ of a moth which has been forwarded to the Director Imperial Institute of Entomology for report. The larvæ of a boring insect was also found attacking cola nut and nutmeg and forwarded for identification.

In October a few cultures of a strain of the parasitic fungus (Cephalosporium lecanii) were received from the Director of the Imperial Institute of Entomology. In his covering letter the Director informed me that the cultures came originally from the Department of Agriculture, Mysore, India where these fungi are common on lecaniid scales. It was not known whether they would attack the diaspid (Ischnaspis and Pinnaspis) scales that do most damage to coconut in Seychelles, but an allied fungus was known to attack the diaspid Aspidiotus destructor.

The Department was advised to inoculate the fungus on to the Lecaniid scales (bernicle jaune, bernicle fil noir et pou vert) on one or more hosts infested by them. Those host plants infested with these scales were sought and potted into kerosine tins, and the instructions sent by the Director relating to the inoculation of the fungus were carefully carried out. Specimens of the inoculated plants were carefully taken before and after treatment. These specimens have been forwarded for the Director's examination and report. It was believed by the latter that the strain of Cephalosporium lecanii already prevailing in the Colony was not as active as it should be in connection with its parasitism on the Diaspid scales of the coconut. Hence the necessity of experimenting with another strain of the same fungus to which Dr Butler has kindly called my attention.

I am also indebted to Professor S. J. Ashby for the examination of cinnamon leaves on which were found very numerous and regularly disposed leafspots. No parasite was found to account for these leafspots but Professor Ashby suggested that the cause of the trouble was probably to be sought in the roots of the Cinnamon tree which is known to be attacked in Ceylon, Mauritius, Java and E. Africa by the fungus Fomes Caryophylli.

Specimens of citrus plants were forwarded to the principal plant pathologist, Pretoria, who found that they were typically infected with Citrus canker (Bacterium Citri). This disease is not easily distinguished from Scab or Verrucosis which however generally causes a destruction of the leaves. In the event of the cultivation of Grape fruit being established in tho Colony any leafspot disease on Citrus noticed by planters should be forwarded to the department and steps taken to eradicate it by burning the whole plant without delay.

Specimens of two of the best cover plants viz ; Vigna hosei, Centrosema pubescens were found in Seychelles to be attacked by the fungus Rhizoctonia Solani which is doing so much harm with cultivated plants all over the tropics. For this and other reasons the small Indigofera endocaphylla which is free from that disease deserves the first place in the Colony among the introduced cover plants.

The Coconut Industry and the Experimental Manuring of Coconut Plantations.

The following table shows the amount of copra exported from the Colony during the past 6 years.

	1927	1928	1929	1930	1931	1932
Tons ...	4,847	4,885	5,435	5,460	5,474	4,732½

A deduction was made of 23½ tons copra produced in a neighbouring island near Madagascar by a planter of this Colony and exported from Seychelles. The copra exported in 1932 represents 33,127,500 nuts, a shortage of 5,010,500 as compared with 1931. The factors governing the crop were not altogether favourable, but the shortage of rainfall during the last 4 years in succession affected the crop for 1932 less than was anticipated. The scale insect havoc although still severe in a few localities is manifestly declining in all districts. This counterbalances the more severe shortage due to deficient rainfall.

It is estimated that 1,246,580 nuts were converted into oil and used by the local soap-manufacturers. 89,000 nuts were exported and 4,000,000 consumed in the fresh state bringing the total number of nuts produced during the year under review to 38,463,000 nuts in round figures.

Coconut planting rightly remains the staple industry in the Colony. Steps are being taken to export copra to Bombay and 643 tons which were held back partly for that purpose were shipped on the 16th February 1933. This amount evidently belongs to the crop for 1932. Owing to the new preferential tariff, it is hoped that some advantage will be derived from exportation to Bombay through the proximity of that market, with its accompaniment of quicker remittances, less freight charges, and reduced loss in transit.

I mentioned last year that the cost of cultivation amounted to Rs 8.50 per acre including the cost of packing. This amount has been further reduced to about Rs 6 owing to the financial depression. The cost of manufacturing copra amounts to Rs 2 per acre including cost of transport to Victoria.

A total expenditure of Rs 8 per acre is very low, and amply justifies the maintenance of a large area of the Colony under coconut palms, although much labour and energy is still lost in maintaining areas in which the culture of that plant has become uneconomic. In the majority of cases coconut planting is still a paying proposition. With the sale price of nuts at Rs 25 and a crop of 3,000 nuts per acre, the profit realised amounts to over Rs 40 per acre. There are very few estates, of which the cost of production has fallen below the sale price. It is only when the crop amounts to less than 700 nuts per acre and the estate unreasonably encumbered, that the cultivation of coconuts has become uneconomic. The effort made by planters in manuring their estates in many outlying islands where the crop has trebled within the last 15 years and reached 3 to 4,000 nuts per acre, is decidedly the method that should be adopted in the Mahé group to escape from the wave of depression from which this Colony is suffering. When there is a fall in price, it is unwise and uneconomic not to increase the crop returns.

It should, however, be borne in mind that the cost of labour has been reduced considerably for the last 3 years. Wages have been reduced by 33 and even 50 o/o. It would be dangerous to reduce again these wages. Necessary relief measures should be adopted to allow planters to carry on for some time until an organised bank system is set on foot, even if for some time arrangements were made to apply for the relief funds in the way that had to be adopted in Trinidad where the position of the cacao planters became worse after 1923, than that of the coconut planters of this Colony.

Manurial Experiments.

In accordance with the recommendation of Mr F. A. Stockdale, C. M. G., C. B. E., Agricultural Adviser to the Secretary of State for the Colonies application was made to the Colonial Development Fund for financial assistance to provide for manurial experiments to be carried out on estates on which the required facilities for these experiments existed.

The system adopted with these experiments which were inaugaurated this year, was to select an area with factors as homogenous as possible with regard to soil composition, surface level, age, condition of trees, and previous treatment. On this area 4 suitably divided one-acre plots are marked out.

The conditions stipulated with the owners of the land are as follows: The fertilizers for these annual applications are supplied free of charge and delivered on the spot. The expenses for the preparation of the plots and the application of the fertilizers are borne by the planters. An application of organic manure (sea weeds, cinnamon refuse, &c.) has to be made in addition to the fertilizers which are turned in by cultivation or in trenches.

The upkeep of the plots consists in selective weeding, leguminous plants being left after a thorough initial clearing of the area. One plot is selected as control and the remainder manured as follows:—

Plot A. 400 kilogs of Fish guano (10—12 o/o P_2O_5) 8·32 o/o N.

„ B. 400 „ „ Bone meal (7 o/o P_2O_5) 7·35 o/o N.

„ C. 400 „ „ Cotton seed meal (6·85 o/o N)
„ 1000 Phosphate guano (25—30 P_2O_5)

„ D. Control, no manure.

The trees in the selected plots are numbered, and the crop of individual trees recorded. Soils samples are taken from each series of experiments.

The total number of experiments started during the year was 18, of which 11 were located in Mahé. Six of the experimental plots in Mahé are situated in the sandy "plateau", the remainder on hill sides in stiff laterite soils. Four series of plots are situated in Praslin, two in La Digue, and one at Sisters Island.

It is hoped that after curtailing the number of experiments owing to the difficulty of having homogencus plots of 1 acre each, it will be found possible to extend them over a period longer than three years. The majority of plots were found to be so much below the proper standard of cultivation and clean weeding and at the same time so much deprived of the soil bacteria which have to be brought into action in manural experiments, that one would be justified in following closely the effect of the manures over a longer period of time.

Sale of Fertilisers.

Prior to the visit of Mr Stockdale in 1931 it had already been decided to assist planters to obtain fertilisers on easy terms of payment. The Government aided by the financial assistance of the Colonial Development Fund obtained at that time the following quantities of fertilisers which were also supplied at the end of 1931 and during 1932.

12 tons Sulphate of Ammonia
12 „ „ „ potash
6 „ Nitrate of Soda
25 „ Phosphatic guano

Recipients of these fertilisers are required to provide a bond as security for payment. The terms of payment cover a period of 7 years, the first two years being allowed free of interest, then payment by 5 yearly instalments with interest at 4o/o.

Two mixtures of the various fertilisers were made during the year. A quantity of the mixture was sold in small lots with appreciable effect amongst planters, many of whom were able to judge the results of concentrated manures for the first time.

The balance in hand consists of about :—

4 tons of Sulphate of Ammonia
3/4 „ Potash
8 „ mixture
4½ „ phosphatic guano

Although the above scheme provides for the supply of fertilisers for a term of 3 years, the difficulty of inducing planters to take advantage of the scheme at this time of financial depression, has made it necessary to curtail the quantities originally deemed necessary.

Copra inspection.

The question of inspecting copra before exportation has received the close attention of the Government and of the Planters' Association during the year. Much ground has already been covered which should enable exporters to send over their copra for inspection in a warehouse at the end of the Long Pier, the copra being afterwards removed within a few days to the exporters warehouses for repacking if necessary. The Planters' Association wanted at one time to have their own inspector, but in face of the difficulties experienced in other countries

which were pointed out to the Committee it was accepted that the Inspector should be under Government employment. That inspection of copra will lead to a restriction of the exports there is no doubt. But many producers have already so much improved their copra houses so that this restriction will it is hoped, be of no great importance. The copra which has not passed the standard test will have to be converted into oil. An attempt has been made already in that direction at the "Palmes" where a modern oil factory has been long in existence. To ensure oil finding a good market price, this installation would have to be modified in accordance with the expert advice received from the Imperial Institute. As long as our copra will fetch £14 on the market, the low grade copra only should be converted into oil. Should the price fall until say £11 is reached, the question of making better oil in the colony either by means of expellers, or a cage hydraulic press will have to be considered. It is even likely that machinery for the refining of the oil under chemical control will have to be introduced and established. This is however an ambitious scheme for the Colony at present, and it may perhaps be more convenient in future to export second grade copra to Mauritius for the manufacture of oil, where it appears steps are being taken to put up an oil refining factory.

It should thus be realised that copra has to be more carefully cured in Seychelles, that it has to be inspected before exportation, and that some of it at least should be converted into refined oil. Much information is being collected from abroad, mostly from Fiji and Zanzibar for the improvement of the manufacture of copra on estates.

Essential oils.

The exportation of essential oils from the Colony during 1932 amounted to the following figures as compared with those of the two preceding years.

	1930.	1931.	1932.
Cinnamon leaf oil Kos.	50,478	54,793	49,669¼
„ bark oil	...	...	30
Patchouli oil	2,341	3,915	2,424
Basilic oil	23	12	3

Cinnamon bark was exported to the amount of 97,540 kilogs.

Although most planters of this Colony became aware, after long experience, that cinnamon, leaves and bark should not be cropped from young trees at frequent intervals, no definite information was available until after the arrival of the Distillery Expert, who although not having published his report informed the planters at a meeting of the Agricultural Board held in December that a better organisation should be adopted for the exploitation of wild cinnamon trees in Seychelles. In conformity with results obtained elsewhere, it has been found that Cinnamon should not be barked before the plants are about 5 years old, and that the branches and stems of the older trees should be exploited with cropping intervals of 3 years. Bark from trees older than 12 years is in a corky condition, and very young barks are both deficient in yield and quality (below 50 o/o aldehydes). The planters prefer at present to export bark, especially bark from old trees, that have not been cropped for a long time, than to distill younger bark at the right time. Bark is mainly used as a flavouring agent for drinks and cakes and probably for the adulteration of quills exported from many other countries to Europe where there is a ready market for it. Corky bark fetches as much as £12 a ton. While supplying material to Mr Holdsworth from the jungle at Niol and in the garden it became clear to me that cinnamon after 2 years and 5 years respectively from date of last cropping produced :—

	2 years.	5 years.
Dry bark per acre	276 kilogs	... 552 kilogs.
Green leaves	2,800 „	... 4,000 „

counting 400 bushes to the acre.

It has been found that bark younger than two years had not reached the stage at which the essential oil has undergone by metabolism, the necessary chemical changes for its transformation into aldehydes. This transformation may be hastened by proper methods of cultivation and manuring, since it is already known that by cultivation, quills are produced in Ceylon at less than 2 years interval between two croppings, although the first crppping is not made before 5 years.

Mr Holdsworth will soon publish his report showing the best method to be adopted for the establishment of the cinnamon industry on a proper footing in the Colony. Planters will have to follow that method, or risk to produce bark oil that will not find a market. Already the sale of cinnamon leaf oil is restricted to a few markets although it may continue to be sold as a cheaper substitute for clove oil so long as the latter oil is used for the manufacture of Eugenol.

Planters should in the meantime exercise their judgment as to whether it is to their advantage to divide the cinnamon fields into compartments that have to be cropped only once in 3 to 5 years, or whether they should continue producing leaf oil every year from bushes with a loss of 50 o/o in the yield, and the likelihood of producing unmarketable bark oil. Bark younger than 3 or 5 years is unfit for distillation. After 5 years, the crop of leaves is doubled and the same amount of oil is produced per acre as with 3 crops at intervals of 16 months. But after 5 years, bark oil which fetches a high price is also produced, while there is no possibility of producing bark oil with more frequent tapping intervals, the bark being peeled from the

branches that are cropped with the leaves. As the quantity of bark after 5 years may be reckoned at ½ a ton producing 2½ litres of oil worth about Rs 50 per litre nett, the planters may be considered as losing at present Rs 125 per acre every 5 years from their cinnamon jungle which may be reckoned as extending over 5,000 acres at least. This represents a loss of Rs 625,000 every 5 years or Rs 125,000 per annum with bark oil at 1/6 per ounce only. By regulating crops, and organizing the distillation on modern lines, cinnamon bark oil industry can eventually be started and made to replace the vanishing cinnamon leaf oil industry without hardly any restriction in the value of exports.

Patchouli. The amount of Patchouli oil can easily be doubled or trebled. It is a profitable industry in connection with, and as an intercalary crop, between coconut palms. It requires good soil and has to be manured heavily. The culture of this plant is indicated in the neighbourhood of cinnamon leaf oil distilleries where so much manurial residue is available. Now that the Distillery Expert has established in (conformity with results previously obtained at the Imperial Institute,) that patchouli distillation should be carried on until the last portions of the oil are extracted in order to obtain an oil of good solubility in alcohol, there is no reason why better prices for Seychelles patchouli should not be obtained in future. Careful grading is already provided for. Time will come when buyers who have naturally a tendency to create and maintain a demand for a cheap article, are convinced that the Seychelles article is in no way inferior to the Penang patchouli oil. The Penang variety of patchouli has been successfully introduced during the year.

Palmarosa. Much ground was covered by Mr Holdsworth in the distillation of various kinds of palmarosa, ginger and citronella grasses. He has found, (in conformity with the results previously obtained at the Imperial Institute in 1931 and 1932) that the palmarosa grasses in Seychelles were intermixed with ginger grass without the possibility of distinguishing the two plants, except by the examination of the distilled oil. Their appearance in the field, and their odour are not always a reliable character especially, when, as in Seychelles, the two plants were introduced at the same time and distributed to planters. Samples of oil distilled by Mr Holdsworth will be examined by him more completely in London. On the odour basis, selection was started in the garden for the establishment of a new nursery from which all rogues and hybrids will be eliminated. A new consignment of palmarosa seeds and plants from India has been ordered and a request has been made to have these plants selected from those restricted geographical areas where Motia plants are not intermixed or grown with the variety of ginger grass or other grasses of the Deccan and Carnatic, where, according to Dr Otto Staph intermediate forms between C. Martini, C. Caesius and C. Polyneuros exist. All grasses of that family are bound to become different when grown in geographical areas other than those in which they are accustomed to grow. In Seychelles Cochin lemon grassses and other citronellas from Ceylon have already acquired distinctive characteristics from those of their country of origin. There is, however, no reason why a pure genuine palmarosa, even if it has its own characteristics should not be produced in Seychelles. This oil being in good demand for the adulteration of Otto of Rose oil.

Eucalyptus Oil.—The results obtained from a small plantation of Eucalyptus citriodora are so good that plantations of this plant have been started by a few planters. The experiment plot consisted of a small area about 100x12 feet on which the Eucalyptus seedlings were set out 3 feet apart in November 1931. The seedlings were cropped at six months and afterwards at 2 months' interval between two croppings. Each time a yield of 16 to 20 litres of oil per ton of fresh leaves was obtained and the weight of raw material was calculated to amount to 6 tons per acre after 3 croppings. A 3-year old tree was cropped in the garden several times, the first time the yield was 19 litres but the growths 2 months' old yielded 16 litres of a better type of oil. It is difficult to establish the plants, they have to be very carefully nursed until they are at least 6 months old.

Ajowan.—A new experimental plot was started, with this plant raised from genuine seeds received in October from the Associate Professor of Botany, Punjab Agricutural College, India through the kind instrumentality of Dr Harold Brown of the Imperial Institute. The seedlings made good growth and were about to be reaped when the monsoon rains set in and the seeds did not mature, whole beds of these delicate plants being washed away or shattered to pieces. A few ounces of seed have been kept for cultivation during the dry season and distribution to planters. A previous experiment had proved in 1917 that Ajowan seeds (Carum Copticum) from the same source and grown in Seychelles yielded an oil containing more thymol than in India. Oils containing a large amount of thymol are in demand in Europe for competition with synthetic thymol. On that account Mr Holdsworth has suggested Eucalyptus dives oil being produced in the Colony. A hardy type producing much thymol is more adapted to the Colony than delicate garden plants which are so easily battered by rains. A great number of oils from other local plants indigenous, or introduced, have been distilled and examined by Mr Holdsworth. His recommendations on that subject are awaited with anxiety in Seychelles, which is a country well adapted for the production of essential oils not only owing to its favourable climatic conditions, and its proximity to the sea, but also because poor soil conditions and dearth of capital preclude more ambitious industries being developed.

Minor industries.

Vanilla. It is very unfortunate that the culture of this orchid has been given up in Seychelles owing to competition with its substitute derived from eugenol, and to the absence of a preferential treatment in the countries where there is still a market for the natural beans in preference to vanillin. Only 1,247 kilogs of beans were exported in 1932 mostly derived from Praslin where the orchid is still grown by about half a dozen planters. No

vanilla having been grown in Mahé for the last 10 or 15 years it may be assumed that the orchid would now be able to withstand the Calospora disease, the germs of which should no longer exist in the formerly badly infested fields. The abundance of cinnamon leaf refuse would provide good material for the mulching of the plantations, should the industry be revived.

Coffee. The Robusta variety has emerged from the experimental stage in many localities, from one of which nearly a ton of parchment coffee is produced per annum. About 60 tons of coffee are imported per annum and there is no reason why the whole of that amount should not be produced in the Colony.

Coco-de-mer. Nearly 5,000 nuts were exported during 1932 as compared with an average annual exportation of 3,000 nuts. These nuts are worth about Rs 1 each and a crop of 3 or 4 nuts per annum can be obtained from a good bearing tree. Such productive plants should have been more protected from destruction in the past.

Areca nuts. The cultivation of this palm is increasing favourably For the first time a planter this year was seen drying a few nuts in a shed for sale locally, There is no reason why areca nut palms should not be set out in the so called marshes where coconuts are usually planted after drainage of the land. Interplanting Areca nuts in coconut plantations is not out of place, since other trees are often allowed to grow under such conditions. Areca palms stand shade very well when they are young, and should eventually be useful as props for pepper. since it is considered that props of hardwood are too expensive.

Sugar cane. As much as 630 tons of sugar ~~cane~~ are imported. A large portion of that commodity is used for the adulteration of bacca, a popular beverage obtained by fermentation of the sugar cane juice. It is not generally known that many palm trees can produce as much sugar per acre as sugar cane. Sugar has also been manufactured experimentally from indian corn.

Allspice. Two trees in the garden produced again in 1932 an abundant crop of berries of which a small quantity was supplied to the distillery and the rest sown in the nursery for propagation. A few plants of Bay oil (Pimenta acris) were also set out in the gardens as a result of the introduction of a few seeds from Ceylon in 1931.

Cashew nuts. This Department is indebted to Mr H. C. Sampson, Economic Botanist, Kew, for information on the Indian methods of preparing cashew nuts for the market. The information was translated into French and circularised. This tree is subspontaneous in Praslin where a drier climate seems to suit it better than in Mahé. It has also been set out for the last 3 years at Fregate island to protect hillsides from erosion. Should an enterprising planter not be found who would establish a small factory for the manufacture of marketable kernels, the nut itself should be exported to India where factories are already being supplied from Portuguese E. Africa. An acre of Cashew nuts in India yields as much as Rs 100 worth of nuts.

The method of preparing the nuts consists in roasting them in small quantities at a time, to get rid of the volatile oil, decorticated, then drying by hot air at 50° c for the peeling by hand of the seed coat which surrounds the kernel, and finally packing in tins into which carbonic acid gas is pumped to prevent decomposition during transit.

Castor plant.—A large consignment of seed was received from Cawnpore together with pure line seeds of high oil content for experimental purposes. Many outlying islands are well adapted to the culture of this plant in the jungle where it would become subspontaneous.

Paddy.—Excellent results were obtained by a planter with mountain rice received from Java. Local strains often grown in small patches are quite inferior to the varieties received.

Pepper.—The pepper plants introduced from Singapore in November 1931 fruited in December 1932. It was gratifying to find that nearly all the flowering spikes that opened in November were bisexual, the small stamens showing at the base of the ovary in each case, while the local strain which flowered later in the garden exhibited unisexual flowers only. The pepper vines received from Ceylon in January 1932 have also grown very well but have not flowered as yet. A consignment of S. Indian vines which were received from Taliparamba Station, which is considered as the birth place of the best selected hermaphodite plants, arrived in June 1932 and the 5 vines which survived are being carefully nursed for propagation.

Dholl.—Not less than 75 tons of dholls and lentils are consumed per annum in the Colony. Much of the dholl (Dal) should be grown locally. It is nothing else than the pigeon pea (Cajanus indicus) which is milled and polished or made slippery mostly by adding a little chalk under the rollers. I am indebted to Dr Youngman of Peradeniya for this piece of useful information. One planter, on my advice, is starting experiments for the culture of this plant in an outlying island where the occurrence of insect pests has not to be dreaded as much as in Mahé.

Onion.—The same planter is also taking up the culture of Teneriffe onions. Experiments in the garden with the Bombay onion Dhulia, has shown in a preliminary experiment that the former variety is better adapted than the latter to local conditions. If the culture of this plant is taken up, as it should, in the outlying islands where a soil of fine texture rich in guano deposite is found almost everywhere, there is no reason why, the 70 tons that are imported annually should not all be produced in the Colony, not to speak of the possibilities of a larger consumption by the poorer inhabitants who are unable to purchase Bombay onions at 10 to 15 cents a lb, and have to fall back on a species of chive as a substitute. It is also probable that in course of time a local strain will be established and found better adapted to cultivation, as onions from Mauritius strains have already been seen to flower in the experimental plots.

Among other plants that have been cultivated with success in the garden, and at Niol, mention can be made of ginger, tuba, turmeric and cardamom, the last mentioned plant producing at 1,000 feet elevation in well sheltered valleys an abundant crop of capsules. Ginger from Mauritius, Cochin, and Jamaica have been experimented with. Although in some cases very good plump fingers were obtained, on the whole, ginger in the granitic islands of this colony are found to produce undersized roots which cannot be exported easily. Nothing however prevents the distillation of the poor roots for the exportation of ginger oil. This is a subject which has not escaped the attention of the Expert Distiller. Two kinds of tuba have already been introduced one Derris elleptica in 1903, and the other D. malaccensis in 1931. Both these plants are doing well and are much appreciated for local use as an insecticide. They are however both creeping plants and have not yet fruited.

Livestock.

Two more Friesland heifers about 2 years old were introduced towards the end of the year from Mauritius, and are at the time of writing undergoing a period of 6 months quarantine at Cerf island, where arrangements have been made to isolate them from other cattle in fly proof cowhouses. They remained about 15 months in quarantine in Mauritius under the charge of the vetenary surgeon of the Department of Agriculture of that Colony, and arrived in good condition. Every precaution is taken against the introduction of Surra disease in so far as it can be guarded against by quarantine measures. Stomoxys flies abound in the Colony. specimens having been sent to the British Museum as far back as 1906.

The pair of cattle of the same breed, introduced from Mauritius in 1930, have made satisfactory progress. The cow is pregnant and is about to calf for the second time. The first calf, a young bull is 18 months old, and arrangements will shortly be made to render his services available in South Mahé. The young bull has reached the size of his mother, ~~and is now adult~~. 22 cows were served by the bull in 1932, but the majority of the offsprings born during the year were bull calves. Milk was sold to the Hospital at the reduced rate of 10 cents per bottle, to the amount of Rs 215. The improvement of the local breed of dairy cattle may be considered as having emerged from the experimental stage. The feeding of Friesian cattle presents no difficulty in this Colony where the pasturage is poor. It is not likely that other breeds of cattle would stand equally well the poor quality of fodder available.

It has not again been possible to continue with the introduction of other live stock such as Black Head persian sheep, pigs, and poultry from South Africa owing to the financial depression of the Colony.

A consignment of 15 Italian Queen bees guaranteed from foulbrood disease from the well known firm of Enrico Penna of Bologna, was received during the year reaching Seychelles by H. M. S. Enterprise on the 22nd July after a voyage by air from Brindisi to Nairobi, by rail from Nairobi to Mombasa and by steamer from Mombasa to Seychelles. The journey proved to be too long (29th June—22nd July) for them and they arrived at Nairobi after a steamer bound for Seychelles from Mombasa had left. Advantage was taken of the departure of H. M. S. Enterprise for their transmission. They were all found dead when the cases were unpacked. The packing was very good and certain bees had started building small combs. The expenditure amounted to a little over Rs 200. A second consignment should be ordered as the local bees have not had the benefit of cross-breeding for over 12 years and fail to make enough honey for the establishment of an industry on sound lines. A certain amount of honey is sold on board the steamers calling at Mahé at R. 1 a bottle, besides bees wax, which is in good demand locally at 75 cents a lb. This home industry like many others deserves every encouragement in the Colony.

Silkworm.—The rearing of these worms which was started last year in my bungalow was handed over to the charge of a pupil who commenced this work in October with eggs from the first brood raised, and a fresh consignment received from Cyprus. A few cocoons were pronounced by the Authorities of the Imperial Institute to be of good quality although small.

Provided regular feeding and cleanliness is observed there is really no difficulty in rearing these insects. Precautions have however to be taken against lizards which until preventive measures were taken to prevent them from getting on the trays, seemed very partial to the worms, biting off their heads but curiously enough not consuming their bodies.

The staple diet *i. e.* mulberry leaves can easily be procured here in garden soil which is well manured, where it can resist the attack of scale insects mostly Aulacaspis Pentagona. The species grown, after elimination of the European varieties (Morus alba, vigna etc.) are Morus indica and Morus incisifolia introduced from Tanganyika. The former appears to make the most vigorous growth and both species are easily grown from cuttings. There are enough plants in the nurseries to enable any one to make a start with the rearing of silk worms. Mulberry plants & silkworm eggs will be issued free of charge, and demonstration can be made & instructions given to any one desirous of starting this cottage industry. The eggs from last year's brood hatched out quite as well if not better than the eggs newly received from Cyprus.

Eriworms.—The department is indebted to Miss M. L. Cleghorn, the Superintendent of Sericulture Bengal for the successful introduction in November of ~~the~~ the eriworm. This lady first very obligingly attempted to send eri eggs through the post. A consignment was also carried in cold storage. None of these were successful. An attempt was then made with cocoons through the post & also in cold storage the carriage of the latter having been arranged with the kind assistance of Captain Robertson of S. S. Takliwa. The consignment received through the post was more successful, 4 moths having emerged in transit, the remainder emerging within 2 days. From this number over one hundred larvæ were hatched, the

succeeding generations producing about 1,300 cocoons. The eriworm is a voracious feeder and devours a large quantity of castor leaves before entering the chrysalid stage.

Correspondence with Miss L. Cleghorn and her sister Miss Olive Cleghorn shows that a lot has been done lately by them for the encouragement of the eriworm industry in India and Ceylon. At any time Miss Olive Cleghorn would be willing to come over to Seychelles and demonstrate sericulture as a cottage industry from egg to the fabric. It appears that handspun eri yarn is much sought after at favourable prices in spite of the competition with artificial silk.

Goats.—Nothing has been done as yet with the wild herds of goats at Aldabra, in spite of the good meat that could be obtained from them with little trouble. Chevon the new official name of goat meat is the cheapest meat available in the tropics. This meat according to Professor Barrett is free from tuberculosis and trichinose.

Rabbits are difficult to raise in Seychelles as they are the victims of many pests and germs.

It is to be deplored that the Dugond or sea cow is extinct in Seychelles, These mammals live entirely on sea weed and it is questionable whether an attempt should be made to re-introduce them from the African Coast or Madagascar for the production of an excellent pork like meat.

An unsuccessful attempt was again made during the year towards the introduction of mangrove oysters from Mauritius. A consignment kindly supplied by Mr Lanferna did not stand the long journey on board a sailing vessel which left Mauritius in calm weather.

A small herd of Aldabra tortoises are raised in the gardens, each reptile being weighed and measured at intervals in order to get an idea of their growth under domestic conditions.

Details of Administration.

Expenditure and Receipts.

EXPENDITURE.

Agriculture Personal Emoluments and other charges	...	...	Rs	21,466.59
Forestry, Rivers and Crown Lands Reserves	...	...	„	6,415.75
Upkeep Botanical and Public Gardens	...	...	„	4,612.19
Destruction of Rats ...	...	...	„	1,731.20
Fisheries ...	...	...	„	600.00
				34,825.73

The above tabulated returns show that only Rs 21,466.59 was spent on Agriculture during the year.

RECEIPTS.

The Revenue consist of :—

Receipt from plantations ...	...	...	Rs	349.04
Sale of timber from Crown Lands ...	...	...	„	211.47
Rents of Crown Lands and Buildings	...	...	„	27,469.55
Royalty on Guano	...	...	„	14,048.50
„ „ timber from Aldabra Islands	...	...	„	37.57
				42,116.13

Staff changes.

A recommendation of Mr F. A. Stockdale M.A. C.B.E., Agricultural Adviser to the Right Honourable the Secretary of State for the Colonies that a Distillery Expert be appointed for a period of one year to conduct investigations of the Essential Oil Industry resulted in the appointment of Mr W. Holdsworth Haines. This appointment is financed as a Grant from the Colonial Development Fund. Mr Holdsworth Haines arrived in the Colony on the 28th February.

Another recommendation by Mr Stockdale was for the appointment of an Assistant Director for a term of two years. The officer selected, Mr F. L. Squibbs has been seconded for this period from the West Indian Agricultural Service. Mr Squibbs arrived in Seychelles on the 29th March 1932.

On the retirement of Senior Forest Ranger Godley in April it was decided to appoint a Garden and a Nursery Foreman. The selected men Mr Tirant and Mr Azemia joined the service on the 1st July and 1st August respectively.

Training of Pupils.

With the sanction of His Excellency The Governor it was decided to admit 2 or three boys between the age of 14 to 20 as pupils. A notice inserted in Government Gazette resulted in eight boys presenting themselves for examination which was held on the 7th of May.

Of these boys the following were ~~were~~ chosen :—

Guy Savy.
Philippe Sauvage.
Reginald Calais.

The last mentioned resigned after a short trial as he found it difficult to carry on without pay. A small remuneration for 3 boys has been provided for in the estimates for 1933. The course is for a period of 2 years. The practical instruction given includes all forms of plant propagation and nursery work including pruning, application of manures, preparation of sprays and spraying, sowing of seeds etc.

Correspondence and Distribution of Information on Agricultural Matters.

976 letters were despatched from the Department's Office. The number of Minute Papers dealt with was 398.

Various pamphlets and copies of reports were distributed to planters interested.

Plant and Seed Exchange.

Contributions of seeds and plants were received from the following countries :—

Ceylon, Pretoria, Tanganyika, Kew Gardens, Java, Sierra Leone, Punjab, British Guiana, India, Mexico, Mauritius.

Seeds and plants were sent to :—

Kew Gardens, Zanzibar, Ceylon, Ethiopia. Pretoria, Java.

Visits to Estates and Agricultural Instruction.

Frequent visits were made by the Senior Officers of the Department to estates in the Mahé and Praslin Group. Special attention was given by the Inspectors of Plantations to visiting the smaller proprietors advising measures for the control of Melitomma.

The distillery expert visited most of the distilleries for the purpose of giving advice.

The reserving of every Tuesdays for planters wishing to meet the Senior Officer at the Botanical Gardens and Nurseries has proved a useful practice. Planters are invited to take full advantage of these opportunities for visiting the department's nurseries and experimental plots.

Summary of legislation affecting crops & fisheries.

Ordinance No. 11 of 1903 provides for the control of Crown Lands, the establishment of River Reserves and the appointment of Forest Rangers.

Ordinance No. 7 of 1919 regulates by license the local sale and removal of the principal agricultural products.

Ordinance No. 9 of 1919 for the prevention and eradication of Plant Pests gives power to the Director of Agriculture to enforce estate proprietors to dispose of all plant debris and the refuse of distilleries and sugar mills.

Ordinance No. 12 of 1925. Controls the importation of all plants and provides for the treatment and eradication of Plant Pests & Diseases.

Ordinance No. 3 of 1926. Authorises the issue of certain fishing licences to control the capture of, and trade in whales and certain fish in colonial waters.

Ordinance No. 9 of 1928. In connection with the manufacture and sale of the liquor called Bacca. The ordinance imposes a tax on lands planted in sugar cane.

Ordinance No. 7 of 1929. Regulates the Fisheries of Seychelles, establishes reserves, and prohibits in these reserves the use of nets and basket traps of certain specified dimensions, this ordinance being amended by ordinance No. 14 of 1932 which provides for the licensing of all fishing nets.

Ordinance No. 11 of 1932. Provides for the compulsory examination and certification of Patchouli oil prior to export.

Ordinance No. 24 of 1932. Amends Ordinance No. 11 of 1903 and extends the limits of the river reserves situated more than 556 feet above sea level.

Reafforestation.

The following plants were set out during 1932 at Niol, in the Botanic Gardens, at Governments House grounds, and in the Coco-de-mer reserves at Praslin.

	1 Niol C. L.	2 Town gardens.	3 Coco de mer reserves, Praslin.	Total.
Nephelium Litchi (Litchi & Rambutan Nephelium Lappaceum ...	48	15	...	63
Anonaceæ (custard apple) ..	35	17	...	52
Punica granatum (Pomegranate from Cyprus) ...	6	15	20	41
Garcinia Mangostana (Mangosteen) ...	...	16	...	16
Citrus Medica var acida (Lime W. I.)	...	20	..	20
Other Citrus.				
(Bergamoti Neroli &c) ...	26	20	2	48
Myristica Fragrans (Nutmegs selected)	28	64	10	102
Artocarpus integrifolia (Jack) ...	105	39	21	165
Lodoicea Seychellarum (coco de mer)	39	47	792	878
Other Palms	131	166	250	547
Afzelia bijuga (Gayac) ..	14	65	...	79
Pimento officinalis (Allspice) ...	...	20	...	20
Bassia longifolium ...	...	72	110	182
Calophyllum parvifolium (Mountain Takamaka) ...	180	...	...	180
Chrysobolanus icaco (Cocoplum) ...	3,000	...	...	3,000
Eucalyptus citriodora ...	...	110	25	135
Tecoma leucoxylon (Calice du pape) ...	...	...	210	210
Trachylobium verrucosum (Gum Gopal) ...	160	...	...	160
Grevillea robusta (silver oak) ...	29	...	...	29
Conifers ...	19	...	...	19
Pterocarpus Indicus (Sangdragon) .	432	...	...	432
Mahogany (Sweetenia Mahogani) ...	117	12	...	129
Tectona grandis (Teak) ...	192	17	...	309
Albizzia moluccana ...	125	...	...	125
Ylang Ylang (Cananga odorata) ...	2	...	...	2
Poinciana regia (Flamboyant) ...	25	...	...	25
Acacia confusa (Wattle) ...	60	...	...	60
Sandoricum Koetjape (Santol) ...	1,602	...	121	1,623
Casuarina equisetifolia (Cedars) ...	1,600	870	...	2,470
Adenanthera pavonina (Agati) ...	990	...	150	1,140
Total ...	8,965	1,585	1,711	12,261

It has been decided to supply seeds of timber trees and cover plants free of charge to allow planters to take up more intensively the reafforestation of mountain sides and summits which have been so neglected in the past. The shortage of timber and fuel has become acute in the last few years owing to the necessity of supplying firewood to the essential oil distilleries. The practice of using coconut husk, shell, stems and leaf branches (petioles) is now of common occurrence but this kind of fuel supply to distilleries is far from being inexhaustible. It has however led to the clearing of estates in a remarkable way. The beneficial effect of removing parasitic organisms from plantations in that way is already shown in places where coconut palms are less and less succumbing to disease than in the past.

A committee was appointed during the year to deal with the necessity of extending to 50 feet the river reserves which had hitherto been limited to 10 and 30 feet within banks of the rivulets and rivers. These more extensive reserves apply to estates over 550 feet elevation where few small settlers reside. Below that elevation nearly all estates are planted in coconuts right down to the edge of the river banks.

When one thinks that there are about 2,500 acres only of land under forest in the Mahé and Praslin groups of islands where the farm areas occupy 40,611 acres and the coconut plantations 22,140 acres and that from this small forest area coconut palms derive almost entirely their food from the percolating water containing nutritive salts running down the hills, one is led to much apprehension as regards the evil effects which will follow the gradual deforestation of the mountain sides. A few progressive planters have realised the importance of this deplorable practice, and have stopped cutting down any tree on the hillsides of their estates, above the coconut plantations. This practice should become general and even be enforced by compulsory measures. Owners of estates on which distillation of essential oils is carried out should not be allowed to cut down trees for fuel unless provision is made by them for replanting their estates at least at the rate at which deforestation takes place.

It has been shown lately that even the barest mountain sides can be reafforested within 20 years as at Niol and in the Botanic Gardens by using quick growing Albizzia, Acacias, Gum copal, Santol, and Tecomas with an undergrowth of cocoplum. The formation of a new layer of humus has led to the almost complete disappearance of insect pests which once threatened the growth of all timber trees as well as that of industrial plants in the gardens. Many pests that are so easily distributed when once a country is deforested, spread with great difficulty when belts of trees of sufficient width interfere with their propagation by wind. One of the worst of scale insects which has affected coconut plantations in the Colony (Pinnaspis buxi) was hardly harmful when it was confined to the summits on Pandanus trees. When once the exploitation of trees for the supply of firewood started, this insect acquired an unexpected virulence until its parasitic enemies came into play 10 or 15 years afterwards. In the interval one can say that the production of nuts was reduced by 2/3rd on many estates.

Regarding the percolation of water down the slopes of the precipitous land of this Colony, it will be found when once the nature and composition of the soil has improved by keeping it under the canopy of forest trees, that terracing the land either by ridge terracing or cross trenching with silt pits would maintain afterwards the fertility of the land. It would be of no use to deforest again new planted areas without taking into account this modern way of maintaining soil fertility and combating erosion. In the garden a piece of land where hardy species of banana would not grow some 10 years ago has been literally transformed by cross trenching and silt pits in their simplest forms. Now that the soil after remaining under albizzias for some time has been terraced, delicate plants such as pepper and Patchouli alongside the zig-zag trenches are found to grow easily without hardly any manure except the leaf fall from the albizzias. The future of this Colony is closely bound up with this easy method of terracing the land. It should be remembered that the ridge terracing is done by digging trenches nearly horizontal at intervals of 4, 5, 10 feet depending on the gradient, a vertical drop of 4½ feet being allowed with gradients of 1 in 10 and by banking up the soil between two terraces. Cross trenching is more easily practised and more applicable to the present status of local planters. It should begin near the top of the slope and the zig-zag trenches should be cut across the field at a grade which will leave the loose earth behind about 1 foot vertical drop in 2 or 300 feet. At the junction of two zig-zags or alongside the trenches where necessary silt pits 2 yards along by 1 deep and 1 wide should be dug to catch the soil particles which are swept along the bottom of the trench. These silt traps are emptied when they are half filled. It would be a surprise to many planters to see how their contents are beneficial to coffee, cacao, pepper etc. On slopes of low grade silt pits alone, in echelons would be found beneficial

Terracing is a very simple method of preventing erosion when combined with tree planting. The colossal albizzias, the gum copal, the Assam rubber tree (Ficus elastica) throw out roots on the surface which form secondary minature terraces by themselves and extend over at a distance of 50 feet from the trees. A self sown Albizzia growing in a rocky patch of the garden was found to produce enormous roots which flattened themselves like the tentacles of an octopus to find a passage between the boulders, these roots regaining their shape beyond the obstacle which was in their way. This is a remark of no small importance in a country like Seychelles where boulders of all sizes, following erosion, cover the ground at every step, in many parts of the archipelago. The Gum copal, the Assam rubber tree (Ficus elastica) and the Sangdragon are nearly equally good in building up terraces on steep land by the expansion of their root system.

Fisheries.

The following table shows the articles exported from the outlying islands during the year as compared with the three previous years : —

		1929	1930	1931	1932
Guano	tons	12,781	15,997	4,730	14,213¼
Tortoise shell	kilogs	995	1,335	963	1,383½
Calipee	„	4,226	3,570	4,439	5,793
Shark fins	„	865	1,095	1,433	1,178
Tropangs	„	6,061	9,647	8,937	4,107
Green turtle shells	„	633	nil	nil	504
Salt fish	„	nil	„	1,100	6,366
Turtle strips	„	1,314	2,567	2,511	1,183
Birds' egg yolk and albumen white	„	29,170	84,227	102,150	55,240
Fresh fish	„	1,043	nil	nil	nil
Turtle oil litres	... ...	nil	4,225	„	4,500
Shark meat	„	„	nil	350	nil
Shark oil litres	... ...	„	„	170	800
Shark skins	„	„	„	300	1,154
Salted turtle meat	„	„	„	nil	679

The above figures show the slow progress made in developing fisheries. Difficulties have been met for exporting fresh fish to Kenya, owing to the Japanese having started supplying this market by fishing off that part of the African Coast. The market for salt fish in Zanzibar is also glutted with the inferior Arabian salt fish. Attempts to compete with that article were unsuccessful although my correspondent declared in a letter to me that the Seychelles salt fish prepared in accordance with Mr Hornell's recommendations, are a 100 times superior to the Arabian commodity. It is very difficult for private firms to push an article on a market without some measure of propaganda and mutual assistance between the two Governments concerned. Exportation of salt fish to Mauritius has progressed but there again an import duty has just been levied to protect local fisheries which are being developed with Government assistance. As an old dependency a sort of preferential tariff should be granted by Mauritius to this Colony the fishing grounds of both Colonies being very near one another and covering the same series of submerged banks and atolls. Réunion island provides a good market but there is very little trade going on with that French Colony and freight is for that reason not easily obtainable. The Bombay market is a special one, where preference is given to wet cured fish. A lot can be done in Seychelles to establish the curing of carangue (Caranx gymnostethoides) in that way, but expert advice for salting in brine this large fish is needed, and a proper modern installation is difficult to start without capital. A new set of problems is being tackled with Government assistance by one firm in the Colony who rightly pointed out that salt fish exportation from this Colony should be supplemented by the manufacture of fish meal, fish oil, glue, and fish guano from the offals and other waste, the profit derived from these additional articles allowing the sale of the salt fish itself at a cheaper rate in Colonies where cheap salt fish is needed. A scheme is under consideration and has been submitted to His Excellency the Governor at the time of writing, under which the treatment of rejected fish and offals would be steamed, deoiled and ground into fish meal, the plant costing a few thousand rupees only.

As regards shark fishing very little progress has been made. The species captured are not well known scientifically. They should first be identified for the production of good shark skins. The same difficulty does not hold good as regards fish meal, fish guano, glue, oil, etc, for the production of which all species seem to be convenient. The following species are captured,

requin blanc—whitish very common
peau claire—lighter coloured skin
endormi—sleeping shark
mentor bleu—whitish but of large size
néné pointe—small species 4 feet long, sharp snout
requin noir—reaches a large size (not common)
requin brisant—fine blackish
marteau—hammer head shark (rare)
Demoiselle—Tiger shark.

The ray fish include :—

raie bouclée
„ crabe
„ pourie
„ cuisinier
„ bibone
„ matafalou.

It has been estimated by an experienced fisherman that 10 o/o of the fish captured in the Colony consist of small sharks. The whale shark (Rhineodon typicus) is of common occurrence in the Mahé group and has not been fished for 60 years. Very little concerning this shark

is known except what can be gathered from the publications of Professor Gudger of the American Museum of Natural History with whom I have been in correspondence ~~with~~ for over 20 years. It is impossible to consider fishing in this Colony without attending to this beautiful animal which often measures 50 feet long and from which valuable skin and oil can be obtained. It seems to have established itself permanently in Seychelles waters having probably come originally from the South Seas near Java from which ocean currents blow towards the N. E. W. of Madagascar striking the Seychelles archipelago on their way round that part of the world. Feeding on tauves (Stolephorus gollingeri Bleeta) and other small bait fish which are abundant in the Seychelles calm and land locked waters, and following the migratory movement of the carangue which prey on the same organisms, it is easily understood why the "chagrin" has selected this Colony as its permanent quarters.

It has been calculated that approximately 1,400 tons of fish are captured in the archipelago per annum and nearly the whole consumed locally, besides turtles. The price per lb of fish is about 3 to 4 cents and during the migratory season (S. E. trade winds) from May to September, and even after, when the migratory fish lay their eggs in the Seychelles, it often happens that a lb of fish is sold at less than 1 cent. No modern appliances are used for fishing, harpoon and rods are practically ignored, only two large nets are used in open bays. All these considerations lead me to think that some exact deductions should be made by an expert on the spot as regards the fishers resources in this Colony. The few marine biologists who visited Seychelles are not of the same opinion. The fish population is not perhaps large enough for the profitable working of large companies but nobody can deny that fish is comparatively speaking plentiful in many parts of the archipelago. About 1,500 fishermen make a good living by lines and basket nets, and it is possible that over an area of 60,000 square miles of submerged banks there are a great many more or less unknown spots where fishing can be advantageously carried out on a fairly large scale for the profit of the inhabitants who are already congested on a land area of 100 square miles only (not to speak of the far distant islands which are on the whole hardly inhabited as yet).

Sea turtles by themselves are numerous enough to occupy the attention of a specialist for the production of turtle meat extract on the spot. All this requires organisation following capital which should be forthcoming without delay as most of the agricultural products of Seychelles are yielding less and less profit with the present selling prices of coconuts and essential oils. Fisheries offer harvest without delay, while the introduction of any new plantation industries necessitate a long period of time for establishment and development. The brightest spot in the future of Seychelles will be the fisheries if tackled energetically.

Much apprehension was felt by many members of the community as regards the shortage of birds' eggs for local consumption which was thought to have decreased owing to the recent establishment of a small industry in the outlying islands for the production of birds yolk and white albumen. Ventilation of this question led to the conclusion that most of the islands nearest Mahé where the seabirds breed (sooty tern) are sufficiently provided with eggs for local consumption, which hardly exceed 500 boxes (of 750 eggs) a month, the whole breeding season lasting only 2 months. From the outlying islands it is impossible to supply the local markets without steam communication the eggs being very perishable in transit. It is from the outlying islands that yolk and white albumen in question are manufactured. These products however cannot compete with similar articles produced from birds' eggs in Indo China. The price of salted yolk from sea birds eggs having fallen, the industry is already declining. The fisheries reserves established by Mr Hornell comprising the whole of the east Coast of Mahé the W. part of Praslin and the East Coat of La Digue, are already showing a much greater fish population. Two small bays on the West Coast of Mahé viz: Anse à la Mouche and Ternay Bay were added to the list of fisheries reserves during the year, they are both of small size and so shallow that the use of the large net was found to throw out of employment many fishermen who make a living there with baskets nets. The fisheries guard in charge of the reserves at Mahé, who, unfortunately, has to work single handed took 19 persons in contraventions, and confiscated 57 fishing baskets with undersized meshes during the year under review.

Meteorological Observations.

The annual rainfall in Seychelles of which the annexed graph gives a good illustration, can be reckoned as an average of 96 inches in the low country. However periodical periods of drought are seen to follow periods of heavy rainfall. This explains the corresponding shortage or increase of the coco-nut crop which occurred in the past and brings into light the havoc done by scale insects which are more virulent during periods of drought. The dry periods 1905—1910 led to the invasion of the green scale and 6 other diaspid scales, that of 1916—1921 to the attack of Pinnaspis and Ischnaspis scales. Much apprehension is felt as regards the result of the drought we have experienced since 1929.

The Seychelles islands are situated in the zone of the S. E. trade winds which blow regularly from May to September. From November to April those winds take their origin further South and do not extend more Northward than 10° S. The N. E. winds during this latter season cross the Equator and blow spasmodically over Seychelles during this period. The area of low barometer with calm and variable winds lies between the zone of the S. E. trade winds and that of S. W. monsoon South of the Equator. This zone outside Seychelles is the starting place of the tropical cyclones of the S. Indian Ocean.

Seychelles was originally a very humid country. Its belt of permanent moisture extending from the highest summits to the littoral where the vestige of huge trees are still to be seen. Deforestation, bush fires, shifting cultivation have brought up the zone of permanent moisture to about 1000 feet elevation. No indigenous trees except alongside protected beds of rivers are now to be seen below that altitude. Erosion and landslips which followed have altered equally the environmental soil conditions. The Capucin tree and other endemics find to-day neither the climate nor the soil conditions which they require but other indigenous palms and most introduced plants as the Mangosteen, Durian, which are suited to zones of permanent moisture, cannot resist any longer, except at great cost, the ill effects of the change of environment. Endemic palms now die out during periods of drought in the shallow soils left to them and only those deep rooted plants that evaporate little water by transpiration from their coriaceous leaves, like the cinnamon, can hold their own any longer.

The biological conditions have also naturally altered and the incidence of insect pests now-a-days is also the consequence of deforestation which should have been severely regulated in the past, with delimitation of mountain reserves.

P. R. DUPONT,
Director of Agriculture.

4th May, 1933.